6.

A

PROBATIONARY

SURGICAL ESSAY

ON

ARTIFICIAL PUPIL.

SUBMITTED,

BY AUTHORITY OF THE PRESIDENT AND HIS COUNCIL,

TO THE EXAMINATION OF THE

Royal College of Surgeons of Edinburgh,

WHEN CANDIDATE

FOR ADMISSION INTO THEIR CORPORATION,

IN CONFORMITY

TO THEIR REGULATIONS RESPECTING THE ADMISSION

OF

ORDINARY MEMBERS.

By JOHN M'FARLAN,

EXTRAORDINARY MEMBER OF THE ROYAL MEDICAL SOCIETY.

MARCH 1820.

EDINBURGH:

PRINTED BY DUNCAN STEVENSON AND CO.

PARLIAMENT STAIRS.

1820.

Q.

ESSAY

ON

ARTIFICIAL PUPIL.

The object which the writer proposes to himself in the following pages, is shortly to consider some of the morbid affections of the Eye, in which it is necessary to form an Artificial Pupil, and the more common methods of performing that operation.

But, in a subject on which there is such a variety of opinions, and in which almost every surgeon has his peculiar views, and his favourite manner of operating, and indeed in which

almost every case requires a particular modification in the treatment, how shall a young practitioner attempt to lay down rules that can be generally approved? In this he cannot hope to succeed: all that he proposes to himself is, simply to state the opinions of some of the more eminent authors who have treated of this subject, and to see how far their observations are generally applicable.

The morbid affections requiring the performance of this operation may be seated either in the iris itself, or in the cornea, so as totally to intercept the direct rays of light that ought to pass through the natural pupil.

Of these morbid changes, whether in the cornea or in the more deeply seated parts, inflammation in general may be said to be the cause. All violent inflammations, having their seat in the ball of the eye, may produce that particular state of disorganization in the coats of the iris which is attended with contraction

or obliteration of the pupil. This state also sometimes follows the extraction or depression of a cataract, though not attended with any symptoms of inflammation. May it not exist in a spasmodic affection of the muscular fibre?

This occlusion of the pupil is frequently combined with adhesions of the iris to the posterior surface of the cornea, or to the capsule of the crystalline lens, which in these cases is likewise opaque.

A central opacity of the cornea is a very frequent case requiring the operation. This, I need not state, is always the effect of inflammation.

Such, in general, may be said to be the state of an eye requiring the formation of an Artificial Pupil.

But, on the other hand, there is a considerable number of cases in which no opera-

tion ought to be attempted; at least in which we cannot with any confidence expect success.

The following passages, from Professor Beer of Vienna's lately published work,* will shew the opinion of that eminent oculist on this point. He begins thus:—" The success of " this operation is very doubtful when the pa- " tient has not a distinct sensation of light; " when the cornea is leucomatous almost to " its edge, or even cicatrized, or covered with " specks; when the cornea is partially staphy- " lomatous; or when there exists any consti- " tutional disease."....." This operation," he continues, " will most certainly be unsuccess- " ful, and threatens the total destruction of " the eye, and is, of consequence, decidedly " contra-indicated, if there no longer remains " any sensation of light, or if we observe the " whole iris and adjoining parts of the interior

* Lehre von dem Augenkrankheiten. *Vol. II, p.* 196, § 163.

" of the eye, viz. the ciliary zone and pro-
" cesses, the vitreous humour and its mem-
" brane, and the vascular system in a morbid
" state, or when the whole eye-ball is disor-
" ganized. The adhesion of the lens to its cap-
" sule, or even its being incorporated with the
" iris, is not by itself any reason against the
" operation, but has an important influence on
" the choice of the method of operation." He goes on still further to state the cases in which he thinks any attempt totally inadmissible :—
" In the first place, the unsound state of the
" iris. Besides the smallness of the ring of
" the pupil itself, one observes a great devia-
" tion from the healthy colour, form, and re-
" lative situation. Its radiating fibres are in
" part pushed forwards towards the cornea,
" in part drawn backwards, so that it be-
" comes puckered into dark blue or black-
" ish folds, between which there is the ap-
" pearance of void spaces situated on the in-
" dentations of the iris, which really are half
" transparent, denoting that in such cases

" the structure of the iris has been totally de-
" stroyed by the previous inflammatory pro-
" cess: round the cornea, the sclerotica is ob-
" served shining through the conjunctiva, of a
" dirty greyish blue, and occasionally portions
" of it more prominent. The morbid state of
" the whole eye, which accompanies the occlu-
" sion of the pupil, and renders the operation
" not only fruitless, but even endangers the
" existence of the eye itself, may consist either
" in a remarkably increased volume by dropsy,
" or in a preternatural smallness, the conse-
" quence of a wasting of the eye, or in an un-
" usual hardness produced by a varicose state
" of the vessels; or lastly, in the extraordinary
" softness occasioned by a dissolution of the
" vitreous humour. The characteristic symp-
" toms of these peculiarities need not be de-
" scribed."

Mr. Gibson, of Manchester, too, in his very excellent work, observes that peculiar state of the iris which the professor of Vienna so ably

describes, and nearly in similar terms. He likewise mentions another variety of disease, in which the cornea, although transparent in the centre, is traversed towards its circumference by deep-seated vessels carrying red blood. It is generally flatter than usual, and bears the marks of previous inflammation. The aqueous humour is deficient in quantity, yet the iris retains its usual form, and is not pressed unnaturally forwards. The size of the pupil is sometimes very much diminished.

The capsule of the crystalline lens is always opaque, and adheres to the inner rim and posterior surface of the iris. On the white surface of the capsule, small red vessels may generally be seen shooting into the substance of the iris. In short, the cornea, the iris, and the diseased capsule, all shew evident marks of morbid vascularity.

Mr. Gibson likewise notices particularly two morbid states of the cornea, in which he thinks

it needless to attempt any operation. These are cases of very extensive opacity, or where it is much and irregularly thickened.

I shall next proceed to state those cases in which Professor Beer thinks that an operation may be expected to succeed. These are his words :—" The formation of an artificial pupil " in general, without any regard to the choice " of the method of operating, is clearly indi- " cated, then, in those cases in which the ex- " isting blindness is occasioned by nothing but " the occlusion of the natural pupil, or by its " being covered by an opacity of the lower " part of the cornea; when the sensation of " light is distinct and strong, in all circum- " stances; when there is no complication, with " a faulty organization and form of some other " important part of the eye, by which the ap- " plication of instruments may be rendered " uncommonly difficult or impossible; when " the eye is already completely, and for some " length of time, recovered from the previous

" inflammation ; and, lastly, when there is no
" constitutional disease present, scrophulous,
" syphilitic, or arthritic, and when the patient
" is totally blind of both eyes."

From the varieties that occur with regard to the different states of adhesion, the presence or absence of a cataract, &c. it is obvious that precisely the same method of operating cannot be equally suitable in all. Mr. Gibson, from whose treatise I shall freely quote, has classed them under five varieties, and has proposed five different modes of operating, suited to each. In this arrangement I shall follow him, and, in concluding, merely advert to different methods proposed by surgeons of eminence in England as well as on the continent.

In the first class of cases Mr. Gibson arranges those in which a central opacity of the cornea, and not combined with adhesions, or with opaque lens or capsule, is the cause of

the obstruction of the passage of the luminous rays to the retina, while at the same time there remains transparent a portion equal to one third of its diameter.

The most fortunate situation for the new pupil, in Mr. Gibson's opinion, is towards the external angle of the eye, and on the lower part. Both because the application of instruments to that part is more easy, and because a pupil towards that part is more serviceable than in any other situation.

In this, however, he differs from the celebrated Beer, who decidedly gives the preference to the inner angle, when there is a choice; but this will be much influenced by the mode of operating that is to be adopted in each case.

Mr. Gibson describes his mode of operating on such a case in the following words:—" The " first step of the operation is to secure the " eyelids, as in the operation for extracting a

" cataract; a puncture is then to be made in
" the cornea with a broad cornea knife, within
" a line of the sclerotica, to the extent of
" of about three lines. All pressure is now
" to be removed from the eyeball, and the
" cornea knife gently withdrawn. The conse-
" quence of this is, that part of the aqueous
" humour is evacuated, and the iris falls into
" contact with the opening in the cornea, and
" closes it like a valve. A slight pressure
" must now be made upon the superior and
" nasal part of the eyeball, with the fore and
" middle fingers of the left hand, till at length,
" by an occasional and gentle increase of pres-
" sure, or by varying its direction, the iris
" gradually protrudes, so as to present a bag
" of the size of a small pin's head. This pro-
" truded portion must be cut off with a pair
" of fine scissars, and all pressure at the same
" time removed; the iris will then recede
" within the eye, and the portion which has
" been removed will leave an artificial pupil
" more or less circular."

Mr. Gibson goes on to state, that by this method of operating, it sometimes happens that the whole breadth of the iris is removed. This he considers no disadvantage; on the contrary, he says it insures a large pupil, and prevents almost the possibility of its closing; though, perhaps, its shape may be a little oblong.

As soon as the operation is finished, the eye is to be lightly covered, and the patient kept for some time in a horizontal position. If pain should come on, some blood may be taken from the arm, an opiate given at night, and a purgative next morning.

In performing this operation, the principal points to be attended to are, to enter the cornea knife at a proper distance from the sclerotic; not to make the puncture too large; and to snip off the whole of the protruding bag at once; for if the aqueous humour be allowed to escape, it will be found impossible

again to protrude a portion of the iris. In which case it will be necessary to draw it out by means of a very minute hook, or to remove a portion within the eye with the assistance of the iris scissars.

If the puncture should be made too large, or too much pressure should have been applied to the eye at the moment of the puncture, so much of the aqueous humour may escape as to render the protrusion of the iris difficult or even improper, Mr. Gibson rather advises the operator to postpone the completion of the operation, to allow the wound to heal, and the aqueous humour to be regenerated.

A circumstance of the greatest advantage attending this operation is, the leaving the lens and capsule undisturbed, and thus avoiding the risk of producing a cataract, which is well known to be a common consequence of a puncture of either of these bodies. At the same time, it is astonishing how wonderfully

slight the inflammation that generally follows such an operation is. Perhaps we might insure this more perfectly by paying stricter attention than is often done to the state of the patient's health, previous to the operation.

When the parts operated on are in a tolerably sound state—when there exists no adhesion of the iris to the cornea—when the aqueous humour is in tolerable quantity—when there is no morbid vascularity of the iris, experience has shewn that a permanently open, and consequently useful, pupil, may be depended on; particularly when the margin of the natural pupil has been divided.

When there remains a tolerable portion of the cornea transparent, vision is wonderfully perfect. Though, perhaps, the patient may be some time before he acquire the habit of using his newly-acquired organ, which, of course, from the circumstances of the operation, cannot be in the natural axis of the eyeball.

Mr. Gibson's next case is that in which a central opacity of the cornea is combined with adhesions, more or less extensive, between the iris and cornea, which include only a portion of the border of the pupil.

In this operation the cornea is to be divided as in the last; and indeed the two operations differ but little, except in the difficulty in the latter of finding a sufficient space of the iris free from adhesions to admit of being protruded. In this case recourse must be had to the hook, which ought of course to be used with the greatest delicacy. When the operator has succeeded in drawing out a portion of it, or if it protrude, as in the last case, the greatest promptness must be used in snipping it off the moment it appears at the lips of the wound.

Should he fail, however, in his attempt to draw it out after one or more gentle efforts, he must avail himself of the iris scissars for

the excision of a portion of it. Sometimes too the forceps may be employed with advantage. But whatever instruments he use, the greatest care should be taken to avoid laceration.

It will sometimes happen that, in making the puncture of the cornea, the surgeon will have it in his power to divide some points of adhesion with the edge of the knife.

However small the portion of the iris protruded, it ought always to be cut off, for the opening thus made, though too small for a pupil, serves for the introduction of the blade of the scissars, a point of some importance.

In the third variety of cases Mr. Gibson has placed those in which, with a central opacity of the cornea is conjoined adhesion of the iris, so extensive as to include its whole border, or nearly so.

" This state requires some change in the

" mode of operation. Before the hook or
" scissars can be used with advantage, it be-
" comes necessary to separate the adhering
" parts as extensively as possible. In this
" case it generally and very fortunately hap-
" pens that the iris is drawn forwards by the
" natural internal concavity of the cornea, to
" which it adheres, so as to be put upon the
" stretch, and is thus separated to some dis-
" tance from the anterior surface of the crys-
" talline lens. Of these circumstances the
" operator must take advantage.

" The point of the knife is to be passed
" through the cornea in the usual way, and
" is to be directed to those adhesions, the di-
" vision of which will most effectually tend to
" render the iris free for the subsequent part
" of the operation. Care must be taken to
" avoid all unnecessary pressure, for the es-
" cape of the aqueous humour renders both
" the cornea and iris flaccid, and consequently

" the separation of the adhesions much more
" difficult.

" Having separated some part of the iris
" from its connexion with the cornea, and
" consequently having made an aperture in it,
" the next step will be to remove a portion of
" it in a convenient situation. If it appear
" sufficiently loose, an attempt may be made
" to draw it out, and cut off a portion of it
" with the curved scissars. If this be found
" impracticable, the iris must be removed
" within the eye, by means of the iris-scis-
" sars."*

The pupil formed by using the scissars will generally be of a triangular shape; that is to say, it will be more easy to make it of that shape than of any other with them.

---

* Mr. G. employs a pair of a particular construction for this operation; but I see no reason for preferring these to the common curved very minute scissars.

It is absolutely necessary that a portion of the iris be removed; at least no permanent opening can be depended upon without taking that precaution. In that case alone, where the upper border of the pupil is dragged down to the inferior part of the cornea, as sometimes happens after the extraction of a cataract, can a horizontal division of the fibres of the iris ensure a permanently open pupil; because, in this case, the fibres have been already put as much as possible on the stretch.

In the fourth division of cases, Mr. Gibson has placed those in which there is a central opacity of the cornea and total opacity of the lens or its capsule, with or without adhesions of the iris to the cornea. In this variety the operation necessary is the same as in the first class of cases, if there be no adhesions. If such exist to any extent, the scissars are to be employed as in the third order of cases. The extraction of the cataract, if in a soft or fluid state, may be attempted at the same time.

But, in general, it is better perhaps to delay that till the eye have in some measure recovered from the effects of the operation; and even then depression, or breaking it down, may be preferable. It is of importance that the existence of the cataract should, if possible, be ascertained previous to operating for the new pupil; because, if soft or fluid, it may be evacuated through the pupil and the puncture of the cornea, or perhaps assisted by the curette. Another advantage attending the plan of depressing the cataract, before beginning to the operation for the pupil, is, that it affords an opportunity of discovering any adhesions that may exist between the capsule and the iris.

In the fifth and last class of cases which Mr. Gibson has described, and which I believe will exhaust almost every variety that can occur, are those in which the cornea remains transparent, but where the pupil is perfectly closed. This state is generally the effect of

inflammation, though sometimes of blows, or of the extraction of a cataract. In this division, the principal varieties are occasioned by the presence or absence of the lens; or by the adhesions that may exist between its capsule and the posterior surface of the iris.

When the lens has not been removed, the first stage of the operation consists in its removal; for it may in general be presumed to be opaque. After it has been removed, and time allowed for the subsidence of any inflammation that may have been excited, the surgeon is to proceed as follows. In making the usual puncture in the cornea, the knife is to pierce the iris, so as to make a wound equal to about one-third of its diameter; in withdrawing it, the operator, if he can, must make another incision at an acute angle to the former, and to the same extent. Should he not be able to accomplish this, it can easily be done by introducing the iris-scissars, with which he must make a third cut, to detach

the flap already formed; and thus form an opening of a triangular and equilateral form.

If the cataract has been couched recently before the operation, fragments of it will be seen presenting themselves at the new pupil; these ought to be removed by the curette, through the opening in the cornea.

In most cases it will be found that a pupil thus formed will have no disposition to close, and that the degree of vision enjoyed will be as perfect as in the ordinary cases of extracting or depressing a cataract.

If both eyes be affected in a similar manner, it may be of consequence to have both operated on, and some pains must be taken to make the two new pupils as similar as possible in shape and size.

Having described these five different manners of operating, it may be presumed that

there can hardly occur a case, in practice, to which one or other of them, or a combination of them, is not generally applicable.

I shall now proceed to state, in as few words as possible, one or two other modes proposed by oculists of considerable eminence, and which may sometimes be employed with advantage.

The first of these that I shall mention is that of the celebrated Scarpa. Having introduced a couching-needle, as in the depression of a cataract, when the point has reached to within half a line of the attachment of the iris to the ciliary processes, he pierces the former, and the moment the point of the needle is seen in the anterior chamber, by an inclination of the haft backwards, thus pressing on the fibres of the iris, and at the same time as it were withdrawing the needle, a portion of that membrane is detached from its insertion into the ciliary zone, to a greater or less extent, as

may be judged necessary. According to the experience of that very justly celebrated surgeon, this operation, though productive of very considerable pain at the moment, is not followed by any alarming symptom, and the pupil remains permanently open.

It appears to me, however, that this operation is attended with some disadvantages. For allowing that no serious inflammation be excited by tearing the iris from its roots, still the number of cases to which it is applicable is limited; for it is evident, that from the difficulty, or even impossibility of introducing a couching-needle at any other part but the external angle of the eye, the artificial pupil can be towards the internal angle only, and we cannot expect to find the cornea transparent, but in a limited number of cases. Another disadvantage attending this operation is the risk of puncturing or otherwise disturbing the crystalline lens and its capsule, when it is still free from opacity. On these accounts, I conceive

that it is not so generally applicable as might be wished. Still, however, in cases in which the cornea is opaque towards the external canthus, or in which we are unwilling to wound it, and in which the lens either has already become opaque, or has been removed, it appears to me a mode of operating that may be extremely useful.

The needle that Scarpa at first used was straight, but he now prefers a curved one, such as he uses in the depression of a cataract. Should a cataract be present, it may also be depressed before withdrawing the needle.

The late Professor Schmidt of Vienna employed a similar method, though I believe his needle was somewhat larger. Before withdrawing the needle, he made himself certain that the pupil was large enough, and that it had no tendency to close from the contraction of its fibres. In either case he endeavours to

detach it to a greater extent by a second application of the point of the needle.

Beer, in his work on the diseases of the eye, already so freely quoted, mentions three different modes of operating, to each of which he thinks there are cases adapted, viz. the corotomy, or simple division of the fibres of the iris; the corectomy, or excision of a portion of that membrane; and the corodialysis, or detachment of the iris from the ciliary processes. In addition to these, he is now in the habit of performing a fourth operation, a sort of combination of the corectomy with the corodialysis. He points out the cases that are best suited to every one of these operations.

The limits of the present paper do not permit me now to enter into the detail of these different cases; I shall therefore confine myself to stating that, in the opinion of the Professor, there are very few cases in which the simple division of the fibres of the iris can procure a

permanently open pupil; therefore that it may almost be abandoned. The corectomy is applicable in those cases in which the iris is presumed to be sound, and enough of the cornea remains clear to admit of the puncture being made in a sound part, without the cicatrix being in the field of the new pupil.*

He makes an incision with the cornea knife, just in the same way as in Mr. Gibson's operation, and with a hook draws out a portion of the iris, and snips it off with the curved scissars.

In the simple corodialysis, a curved couching needle, similar to that used by Scarpa, is pushed through the cornea, and with its point a portion of the iris is torn from its attachment. Without withdrawing the needle, he waits to see that this loose portion has no inclina-

---

* It is an opinion of Professor Beer, that a wound of an opaque part of the cornea may be followed by very bad consequences.

tion to resume its natural position; if it have, he tears away a little more, and endeavours to make it retain the situation he gives it, by pushing it into a corner of the chamber of the aqueous humour. In cases where he has reason to think the lens opaque, or where it has been removed, Beer sometimes performs the operation of Scarpa and of Schmidt. The other operation that I mentioned is now more frequently performed by him than either of the former, and, in several instances that I have seen, with perfect success. Having made a puncture to the extent of not more than three lines, with a lancet-shaped knife, through the cornea, at the distance of two, perhaps three from its edge, he introduces a very slender pair of forceps, terminating in each blade with a very small hook, at right angles to the plane of the movement of their spring. By means of these he is enabled to retain a very firm hold of that portion of the iris that is engaged in them, which ought to be its very edge. The next object is to detach it from the ciliary pro-

cesses, and to draw it towards the wound in the cornea, and still keeping it firm in the forceps, gently to pull a small portion of it altogether out, when the operator must be in readiness to cut it off with the curved scissars. There will then be formed a pupil that will have no disposition to close, and which cannot fail to be of a sufficient size, though of an irregular form. The cases in which this operation is chiefly employed by the Professor are those in which his common corectomy is inadmissible from an opacity of the centre of the cornea, or where there is reason to expect a considerable quantity of coagulated lymph, or false membrane in the situation of the lens, presuming that it has been already removed.

It now remains for me only to state the very ingenious method suggested by Sir William Adams, in his late work on Cataract. When he has occasion to make an artificial pupil, in a case where there is a cataract not quite fluid, he breaks it down by means of his

cutting needle, and having made a sufficient opening in the iris with the same instrument, he contrives to interpose some of the fragments of the cataract between the lips of the wound in the iris, where they are gradually absorbed, but not until there is no longer any chance of the wound uniting by adhesion. When they do become absorbed, however, the pupil may be expected to remain perfectly clear.

Ingenious as this idea, no doubt, is, I fear that, in reality, there are but few cases to which it is perfectly suited, considering how seldom it is that we meet with a cataract precisely of the degree of consistence that is fit for cutting into thin slices, to be laid between the lips of a wound, in so thin a membrane as the iris.

I shall now conclude these detached remarks by observing, that from the number of important, though delicate textures, that may be affected by the circumstances requiring the

performance of this operation, there must be endless little varieties in the cases, each requiring some different modification of the manner of operating, and for which it is impossible to lay down any certain rule; and that in all much must always be left to the good sense and skill of the surgeon.

Since these pages were submitted to the Examinators of the Royal College, the writer has had much pleasure in perceiving that the observations contained in them receive additional authority from their coincidence with those in a valuable treatise on the same subject, by Mr. Guthrie of the Mary-le-bonne Eye Institution.

FINIS.